General Notes.

GEOLOGY AND PALEONTOLOGY.

The Glacial Catastrophe in Savoy.—The torrent of ice and water which caused such a lamentable loss of life at the baths of St. Gervais in July last was so extraordinary that M. Vallot, Director of the new Mont Blanc Observatory, determined to explore the region from which the avalanche descended with a view to discovering the cause and to prevent the recurrence of so horrible a catastrophe. In company with M. Ritter and two guides he ascended the mountain to the base of the Aiguille du Goûter. Here they found an apparently insignificant glacier, the Tête Rousse, which proved to be the source of the outbreak. This glacier forms a plateau nearly horizontal. It advances over an inclination of 40° between two converging ridges into a basin which has for an outlet a narrow rocky ravine. The front of the glacier has been torn away, exposing an enormous arched cavity, filled recently with ice. This cavern communicates by a narrow passage strewn with blocks of ice, with a sort of crater 270 feet long and 133 feet deep, having perpendicular walls of polished transparent ice, an indication of prolonged contact with water.

It is the opinion of M. Vallot that a lake had been formed at the bottom of the glacier and crater. This water had undermined the ice crust over the upper cavity. When the ice crust collapsed the tremendous pressure transmitted to the lower grotto caused the rupture in the anterior part of the glacier. This explains the enormous quantity of water precipitated at once into the valley, carrying with it the soil of the banks, forming a torrent of liquid mud mixed with ice-blocks and rocks.

It is estimated that 100,000 cubic metres of water and 90,000 of ice issued from the glacier. It is possible the sub-glacial lake may re-form, and in view of the possibility M. Vallot advises blasting the rocky bottom to provide an escape for the water.

The Iron Ores of the Lake Superior Region.—Mr. C. R. Van Hise has brought together under this title all the more important conclusions upon the subject which have been reached in recent years by the Lake Superior Division of the U. S. Geol. Survey.

It is now definitely known through Irving's researches that these ores, like many of a later age, are derived from carbonate of iron.

The ores now mined occur in two geological series, the lower Huronian and the upper Huronian. The lower Marquette series may be taken as a type of the first, and the Penokee ores of the second.

The Penokee ore deposits are roughly triangular in cross-section. They usually dip to the east. They rest upon impervious formations below, and generally grade upward into a porous ferruginous chert or slate of iron formation. The lower Marquette series vary greatly in shape, lie for the most part upon impervious formations in pitching troughs, and grade above into broken and porous material of the ore formation.

As to the genesis of the ores, the author thinks that all evidence goes to show they are concentrations produced by downward percolating waters. These waters removed a part of the original material of the iron-bearing formations at the places where the ore-bodies occur, and introduced iron oxide almost simultaneously. This explains the forms, positions, and relations of the ore deposits. They rest upon tilted walls or troughs of impervious formations because water has here been converged. They occupy the place of the original ore formation because this is easily penetrated by water, because it was rich in iron carbonate, and because the constituents other than iron oxide are readily soluble.

The interchange of silica and iron oxide is observable. The change from the ore bodies to the rocks above is a transition, and along this transition zone the silica bands die out by a gradual removal. In the iron formation proper the silica is frequently in solid bands alternating with bands richer in iron. In passing toward the ore the stratum is porous, due to cavities left by the removal of the silica, but before all the silica is removed, iron oxide begins to be introduced, and finally the solid body of iron ore occupies the place of the siliceous band.

The iron ore does not appear throughout the Huronian rocks of Lake Superior, but only in definite formations which constitute a small percentage of the entire Huronian series.—*Trans. Wis. Acad. Sci. Arts and Letters, Vol. viii.*

The Geology of Nicaragua.—In an abstract of Notes from a Geological Survey in Nicaragua Mr. J. Crawford states that Nicaragua, geologically considered, can be divided from north to south into five zones, differing from one another in lithological, mineralogical, and structural characters.

The first division embraces the central mountainous parts, and contains Laurentian, Taconic, Cambrian, and Siluric rocks, also Devonic rocks unconformable to the last. The second division, parallel to that just named, and extending to within a hundred miles of the Caribbean Sea, contains sediments of Carboniferous, Permian, and Mesozoic ages, covered unconformably by Cenozoic and modern formations. In some of the rivers of this division are rich gold placers. The third division is the delta on the eastern coast. Evidence furnished by alluvial deposits and coral reefs indicates recent subsidence until a few years ago, when elevation commenced. The fourth division is on the western side of the first (central) division. Its rocks are generally similar to those of the second division. In some places dykes are connected with lava-flows. In the valley of the Rio Viejo is a tertiary mammaliferous deposit with Toxodonts, etc. The fifth division occupies Western Nicaragua, and contains several small crater-lakes of the Vicksburg, Yorktown, and Sumter periods; all the post-Mesozoic Nicaraguan volcanoes are in this division.—*Quart. Jour. Geol. Soc.*, 1892.

Cope's Lectures on Geology and Paleontology.[1]—This series of lectures prepared for the Extension Course of the University of Pennsylvania forms a basis for the study of geology. They are rather elementary in character, and at the end of each chapter will be found directions as to collateral reading and home work.

Part 1, Geology, opens with a short introduction defining the subjects which constitute the science of geology. The author then takes up in turn structural, dynamic, historic, and lithological geology. The salient features of each are put concisely, but clearly, so there can be no misunderstanding of the subject. The latest discoveries in American stratigraphy are noted. An addition of importance is a chart which gives the realms, systems, and series of interior and coastal America, Europe, and other countries, showing at a glance their relations to each other.

Part 3, Paleontology, embodies the latest reliable information as to the characters of the Vertebrata, their homologies, affinities, and geological position. The author adopts the division of the vertebrata into four superclasses, Hemichorda, Urochorda, Cephalochorda, con-

[1]Syllabus of a course of lectures on Geology and Paleontology. Part 1, Geology, Part 3, Paleontology; by E. D. Cope, Ph. D., Professor of Geology and Paleontology in the University of Pennsylvania. Phila., 1891. For sale by A. E. Foote, 4116 Elm Ave., Phila.

taining one class each, and Craniata, subdivided into five classes, viz.: Agnatha, Pisces, Batrachia, Monocondylia, and Mammalia.

The greatest changes in classification, as a consequence of the latest accessions to the knowledge of the subject, will be found in the Pisces.

In classification the definite characters are brought into prominence and analytical keys are adopted as the most perspicuous method of exhibiting them.

Carefully prepared charts give accurate ideas as to the geological range of the different orders, and of the time relations of these to each other.

The books are profusely illustrated with cuts and drawings, many of which represent American material.

Crook on Saurodontidæ from Kansas.[2]—In this paper the author gives anatomical descriptions of some species of Portheus and Ichthyodectes from the Niobrara chalk of Kansas, and makes some comments on the systematic position of the Saurodontidæ and of the Erisichtheidæ. The anatomical work is good, and some needed rectifications of original descriptions are made. We find it necessary, however, to make some comments on the systematic part of the work, in which are to be found numerous oversights.

In the first place the author has not observed that I have on several occasions published the fact that the name *Daptinus* Cope is a synonym of *Saurodon* Lea, which was proposed many years previously. It was from this genus that I gave the family the name first proposed, of Saurodontidæ. The fact that Prof. Zittel many years later gave this name to a very distinct family does not authorize the giving of a new name to the family first so called by me, as is done by Mr. Crook. It only signifies that another name should be used for Prof. Zittel's family, as I have proposed in THE AMERICAN NATURALIST, 1889, p. 858 (Macrosemiidæ). The statement that my original Saurodontidæ embraced a genus which does not pertain to it should be supplemented by the information that I removed this genus (Erisichthe) from it, and established a new family for it (Erisichtheidæ), only two years later[3] than the date of the publication of my volume on the Cretaceous Vertebrata. In the next year I made the Erisichtheidæ the type of a new order, the Actinochiri,[4] adopting, however, the name Pelecopter-

[2]Ueber einige fossile Knochenfische aus der Mittleren Kreide von Kansas; von Alja Robinson Crook. Palaeontographica, Vol. xxxix. 1892, p. 107.

[3]Bulletin U. S. Geolog. Survey Ter., 1877, iii, p. 822.

[4]Proceeds. Amer. Asso. Adv. Science, 1878, p. 299.

idæ, as I had already proposed this name in the work above quoted (1875) before I was aware of the affinity or identity of the genera Pelecopterus and Erisichthe. All this has been overlooked by Mr. Crook.

Mr. Crook further states that only three genera, Portheus, Ichthyodectes and Saurodon (Daptinus), belong to the family. But Hypsodon and Saurocephalus should not be omitted. He also observes that I gave the name Portheus because of the resemblance of the fishes it embraces to the bull-dog; and that the word does not occur in any Greek or Latin lexicon. Just why Mr. Crook thinks that Portheus has any relation to bull-dog he does not tell us, but if he will look in the Greek lexicon he will find that *πορθειυ* means to destroy, and from this verb the substantive is easily derived. Finally the species of Ichthyodectes, regarded as new by Mr. Crook, and named *I. polymicrodus*, is probably the *I. arcuatus* Cope.[5] This species is one of several from this horizon which would have been figured long ago by me had not it been for the policy pursued by the present U. S. Geological Survey.

Mr. E. T. Newton, in an otherwise able article[6] some years ago, resolved that the catalogue name Protosphyraena of Leidy should be used instead of Erisichthe. Apart from the fact that Leidy's name was published without description, thus putting it outside the pale of recognition, the name was made to apply to two very different species, *P. ferox* and *P. striata*. *P. ferox* belongs to the genus called by me Erisichthe, while the *P. striata* belongs to another genus. According to the usual custom, the Leidyan name, if used at all, should be applied to the *P. striata*, since the *P. ferox* had been referred to another genus. This rule was, however, not followed by Mr. Newton, and Mr. Crook imitates him.—E. D. Cope.

On the Permanent and Temporary Dentitions of Certain Three-toed Horses.—At a meeting of the Philadelphia Academy held Oct. 4, 1892, Prof. Cope described the changes in the characters of the superior molars of the *Protohippus placidus* Leidy, resulting from age and wear, and the characters of the dentition of colts of Protohippus and Hippotherium. He pointed out that in stages of wear up to middle life the *P. placidus* is the *Hippotherium gratum* of Leidy, and that then the protocone fuses with the paraconule, and the

[5]Proceeds. Am. Philosoph. Soc., 1877, p. 177; *Portheus arcuatus* Cope, Cretaceous Vertebrata, 1875, p. 204 (not figured).

[6]Quarterly Jour. Geol., London, 1877, p. 505.

animal becomes a Protohippus. He had not observed this to take place in any other species referred to Hippotherium. In both these stages the enamel borders of the lakes are more or less plicate, and the posterior loop of the anterior lake is present. With further wear the plications, including the loop, disappear, when the molars agree in their characters with the *Protohippus parvulus* Marsh. These observations were based on specimens from the Loup Fork beds of Nebraska, Kansas, Colorado and Texas, where the species is abundant.

The speaker exhibited the molar dentitions of three colts from Wyoming and Texas, and a part of one from Colorado, all from the Loup Fork beds. He showed that these represent the genera Merychippus, Parahippus, Hypohippus, and Anchippus of Leidy, and six species of the same author. He thought it probable that Anchippus belongs to a colt of Hippotherium, and Parahippus and Hypohippus to Protohippus, while he was not certain as to the reference of the type of Merychippus (*M. insignis*). He pointed out that the characters of the individual temporary molars differ in the different teeth of the series, and also differ at different stages of wear. As with the permanent dentition, in some species the temporary molars are always simple, while in others the enamel borders are more complex. In the latter case the pattern becomes more simple in some respects with prolonged wear. He was able to correlate the temporary and permanent dentitions of *Protohippus perditus* Leidy with certainty, and those of *P. pachyops* Cope and *P. mirabilis* Leidy with much probability.

Prof. Cope further pointed out that the temporary dentition in these three-toed horses is more simple than that of the adult, in some cases resembling very closely the permanent dentition of the ancestral Anchitherium in molar structure. In this the horses differ from the higher Artiodactyla, where the temporary molars are equally complex or more so than the permanent molars.

The accompanying plates (XXV, XXVI) illustrate the statements made above. In Plate XXV we have the gradations in the pattern of the grinding surface of the molars in the *Protohippus placidus* Leidy. Figs. 1 and 2 represent the more complex hippotheroid stage of early wear, and in Fig. 3 a simpler stage of the same. Figs. 4, 5, and 6 represent the more worn protohippoid stages with greater and less complicity of pattern. That individuals differ as to the stage at which this occurs is shown by Fig. 6, where the crown is less worn than in Figs. 4 and 5. In Fig. 7 we have an old animal with crowns fully worn, showing the full protohippoid pattern, with simple pattern. Fig. 8 is the corresponding inferior series. All natural size.

In Plate XXVI the deciduous dentitions of various three-toed horses are shown, of the natural size. Fig. 1 is probably *Protohippus pachyops* Cope; 2 is *P. perditus* Leidy, displaying two permanent and one deciduous molar; Fig. 2, external view, 2 *a* the crowns. Fig. *m.* i is the just protruded first true molar, and Fig. *d.* 4 is the fourth deciduous molar much worn. Fig. 3 represents an undetermined species, and Fig. 4 is referred provisionally to the *Protohippus insignis* Leidy. Fig. 5 represents three superior permanent molars of the *Protohippus medius* Cope, much worn.

The relations of these to the adult forms are discussed in a forthcoming bulletin of the Geological Survey of Texas, from which these plates are copied.—E. D. COPE.

Geological News.—Paleozoic.—A reptilian skull from the Karoo Beds, Cape Colony, has been referred by H. G. Seeley to a suborder, Gennetotheria, which lies midway between the typical Theriodonta and the Dicynodonta. The species, to which the name *Delphinognathus conocephalus* has been given, indicates a new family of fossil Reptilia distinct from the Ælurosauridæ, distinguished by the conical parietal with a large foramen, the supracondylar notch, and other modifications of the skull and teeth.—*Quart. Jour. Geol. Soc.*, 1892.——Mr. J. F. Whiteaves has published a paper on the Orthoceratidæ of the Trenton Limestone of the Winnipeg Basin in the Trans. Roy. Soc. Canada, 1891. It consists of a critical and systematic list of the Orthoceratidæ at present in the Mus. of the Geol. Survey of Canada, from the formation and region indicated by the title, together with descriptions of seven new species.——Messrs. Etheridge, Jr., and Mitchell are publishing a series of papers in the Proceeds. of the Linn. Soc. on the Silurian Trilobites of New South Wales. The first appears in Vol. vi, Part 3, and is devoted to the family of Proetidæ. Of the three members described, two, *P. rattei* and *P. australis*, are new.——A collection of fossils from the magnesian limestone of northeastern Iowa, described by S. Calvin, leaves little doubt as to the equivalency of that formation with the calciferous series of northeastern New York.—*Am. Geol.*, Sept., 1892.——Mr. N. H. Darton announces the discovery of organic remains of ordovician age in the so-called Archean rocks of central Piedmont, Va. The remains are crinoids, closely allied to *Schizocrinus*, *Heterocrinus*, and *Poterocrinus*. The exact position of the terrane in the ordovician is yet uncertain.—*Am. Jour. Sci.*, July, 1892.

Mesozoic.—British Cretaceous Foraminifera are receiving attention at the hands of various students. A monograph on the Foraminifera of the Gault by Chapman, published in the *Journal of the Microscopical Society*, is a most valuable reference work, as the author has treated the subject in an exhaustive manner. Another series of articles on the Foraminifera of the Trias, by Messrs. W. D. Crick and C. Davies Sherborn, appears in the *Journal of the Northamptonshire Natural History Society.*——According to Hyatt the Jura-Trias is well-developed about Taylorsville, California. The age of the Trias as indicated by its fossils is that of the Noric and Karnic series in the upper Trias. The lower, middle, and upper Jura are all represented in the fossil faunas of the region, and particularly in those of Mt. Jura, near the center of the area. A scarcity of vertebrate remains is a feature of this region in common with the entire column of the Trias and Jura along the western slopes of the Sierra Nevada and the Andes. (Bull. Geol. Soc. Am., Vol. iii.)——Prof. A. Gaudry announces the discovery of the snout of a Pythonomorph in the upper Cretaceous of Cardesse, not far from Pau, which must have been 10 metres long. The snout resembles that of *Mososaurus giganteus* of Maestricht, with considerable difference as to dentition. He names it *Liodon mosasauroides.—Revue Scientifique*, Aug., 1892.

Cenozoic.—The Proceeds. London Zool. Soc. for 1891 contains some interesting descriptions and plates of fossil birds by Mr. Lyddekker. These comprised a new Moa from New Zealand named provisionally *Pachyornis rothschildi*, which affords the writer tolerable evidence that the typical species of *Anomalopteryx* and *Pachyornis* were differentiated from a common ancestor; a large extinct stork, *Propelargus* (?) *edwardsii*, from the Allier Miocene, evidently very closely allied to genera still existing; and several species from the Sardinian and Corsican Islands——Two mammals, *Cervus pachygenys* and *Antilope maupasii*, have been added by M. A. Pomel to the list of those discovered by him in the Plistocene formations in Algeria.——Mr. Clement Reid intimates that during the Glacial Epoch there was throughout Central Europe a period of *dry* cold, causing that region to resemble the arid wastes of Central Asia. These desert conditions seem to have extended in a modified degree into the South of England. —*Natural Science*, Aug., 1892.